United Nations Environment Programme

UNEP/GEF South China Sea Project

Global Environment Facility

Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand

USER MANUAL

FOR

THE SOUTH CHINA SEA NUTRIENT CARRYING CAPACITY MODEL

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1. PREPARING MICROSOFT EXCEL TO RUN THE MODEL

The first thing you need to do is to prepare Microsoft Excel to run the model. This involves making sure that you have the "Solver" add in, and selecting the correct level of macro security.

1.1 Selecting the Solver add-in

STEP 1 – Open Microsoft Excel (see **Image 1.1.1**).

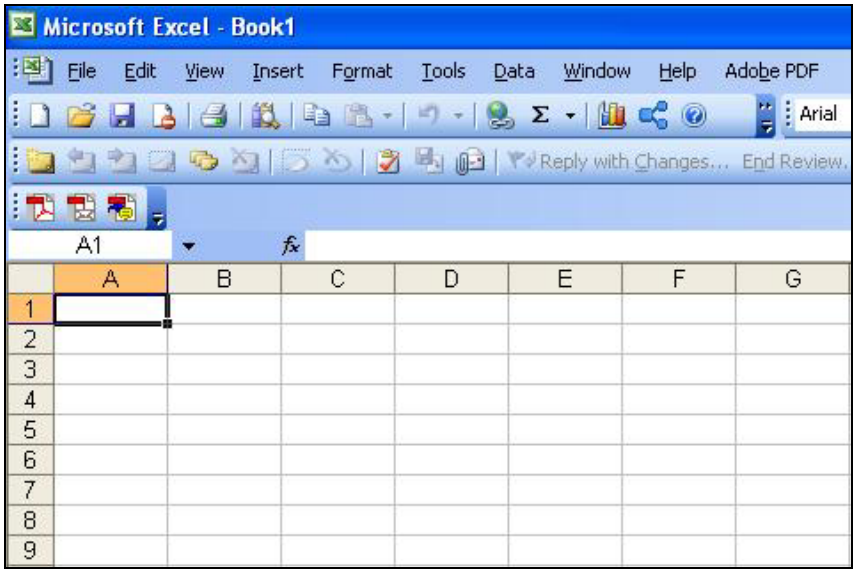

Microsoft Excel - Book1
File Edit View Insert Format Tools Data Window Help Adobe PDF
Arial
Reply with Changes... End Review...
A1
A B C D E F G
1 2 3 4 5 6 7 8 9

Image 1.1.1 A blank Microsoft Excel spreadsheet.

STEP 2 – On the main toolbar, select **Tools** then **Add-Ins…** (see **Image 1.1.2**).

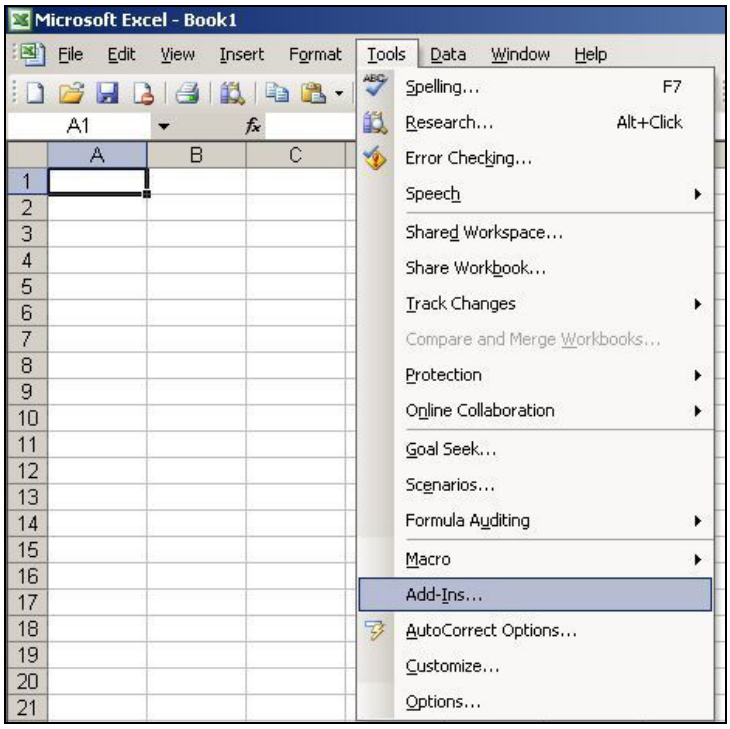


Image 1.1.2 The **Add-Ins…** option on the main toolbar.

STEP 3 – Check the **Solver Add-in box** and click OK (see **Image 1.1.3**).

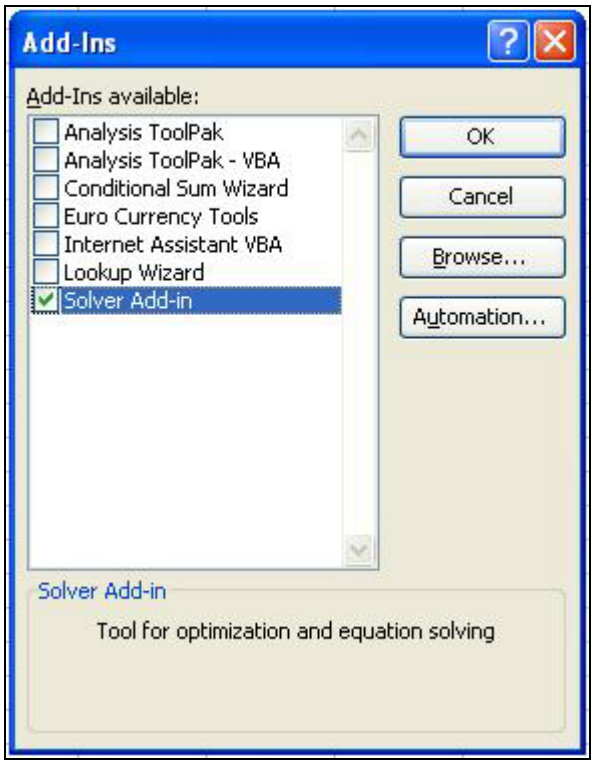


Image 1.1.3 The Solver Add-in option selected.

Important Note – SOLVER ADD-IN. If the Solver Add-In option is not listed in the Add-Ins box, you should reinstall Microsoft Excel and select the solver add-in from the custom installation option.

1.2 Setting the appropriate macro security level

STEP 1 – Select **Options** in the **Tools** menu of the main tool bar (see **Image 1.2.1**).

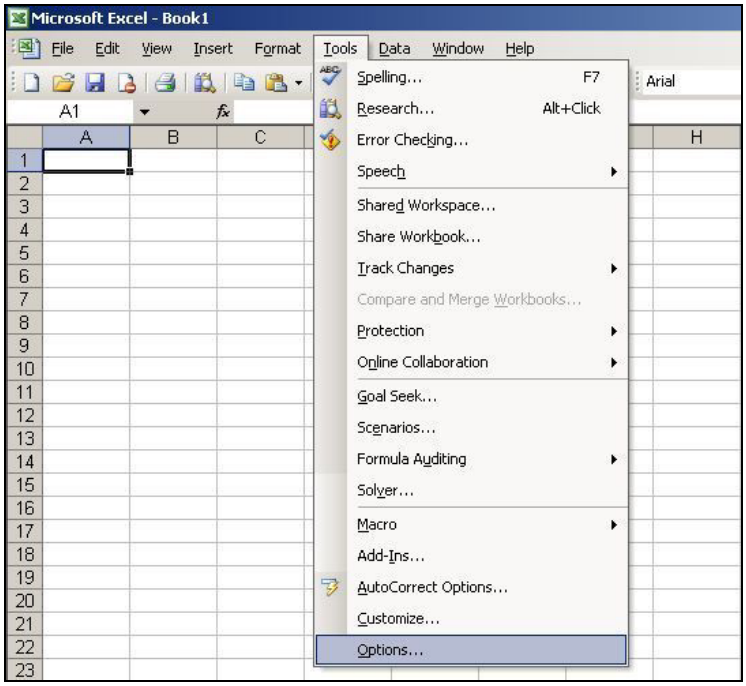


Image 1.2.1 Options in the Tools menu of the main tool bar.

STEP 2 – Select the **Security** tab on the **Options** box (see **Image 1.2.2**).

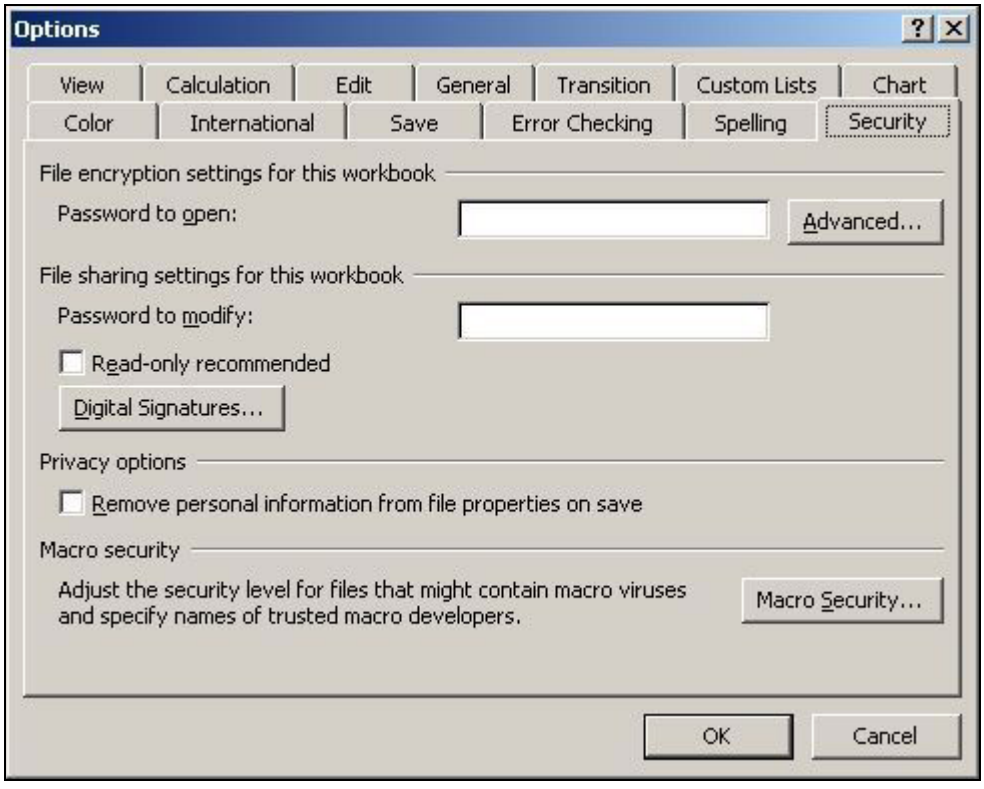

Options
View Calculation Edit General Transition Custom Lists Chart
Color International Save Error Checking Spelling Security
File encryption settings for this workbook
Password to open:
Advanced...
File sharing settings for this workbook
Password to modify:
Read-only recommended
Digital Signatures...
Privacy options
Remove personal information from file properties on save
Macro security
Adjust the security level for files that might contain macro viruses and specify names of trusted macro developers.
Macro Security...
OK
Cancel

Image 1.2.2 The security tab on the options box selected.

STEP 3 – Click on Macro Security... on the **Security** page of the **Options** box shown in Image 1.2.2.

STEP 4 – Select **Medium** on the **Security Level** page of the **Security** box (see **Image 1.2.3**).

Security
Security Level
Trusted Sources
Very High. Only macros installed in trusted locations will be allowed to run. All other signed and unsigned macros are disabled.
High. Only signed macros from trusted sources will be allowed to run. Unsigned macros are automatically disabled.
Medium. You can choose whether or not to run potentially unsafe macros.
Low (not recommended). You are not protected from potentially unsafe macros. Use this setting only if you have virus scanning software installed, or you have checked the safety of all documents you open.
Virus scanner(s) installed.
OK
Cancel

Image 1.2.3 The **Medium** macro security level selected.

Important Note – SECURITY LEVEL. You are strongly advised not to set the macro security level to low as your system as your system will be very vulnerable to potentially unsafe macro viruses from other sources.

2. DOWNLOADING MODEL DATA

The data for running the carrying capacity model can be downloaded from the Nutrient Carrying Capacity Model page of the South China Sea Project website <www.unepscs.org>.

STEP 1 – Access the Nutrient Carrying Capacity Model page of the South China Sea Project website (see **Image 2.1**).

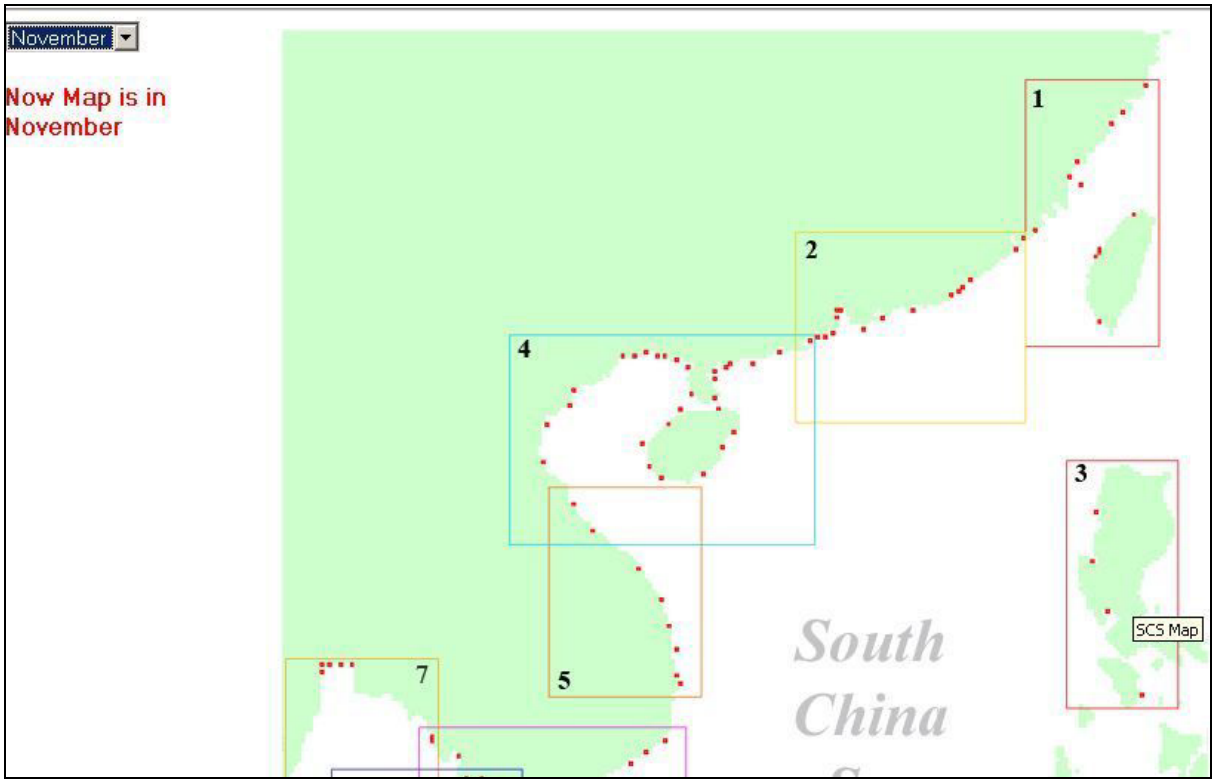


Image 2.1 The Nutrient Carrying Capacity Model page of the South China Sea Project website

STEP 2 – Select the **month** for which you would like to download data for from the drop-down menu on the top left hand side of the page.

STEP 3 – Click on 1 of the 13 sub-zones boxes for which you would like to download data for and click Save on the **File Download** box (see **Image 2.2**).

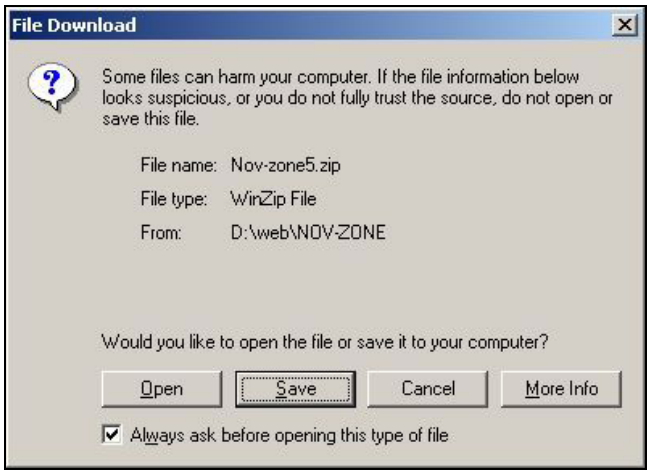

File Download
Some files can harm your computer. If the file information below looks suspicious, or you do not fully trust the source, do not open or save this file.
File name: Nov-zone5.zip
File type: WinZip File
From: D:\web\NOV-ZONE
Would you like to open the file or save it to your computer?
Open
Save
Cancel
More Info
Always ask before opening this type of file

Image 2.2 The File Download box.

STEP 4 – Save the “zip” file to your computer by clicking **Save** on the **Save As** box (see **Image 2.3**).

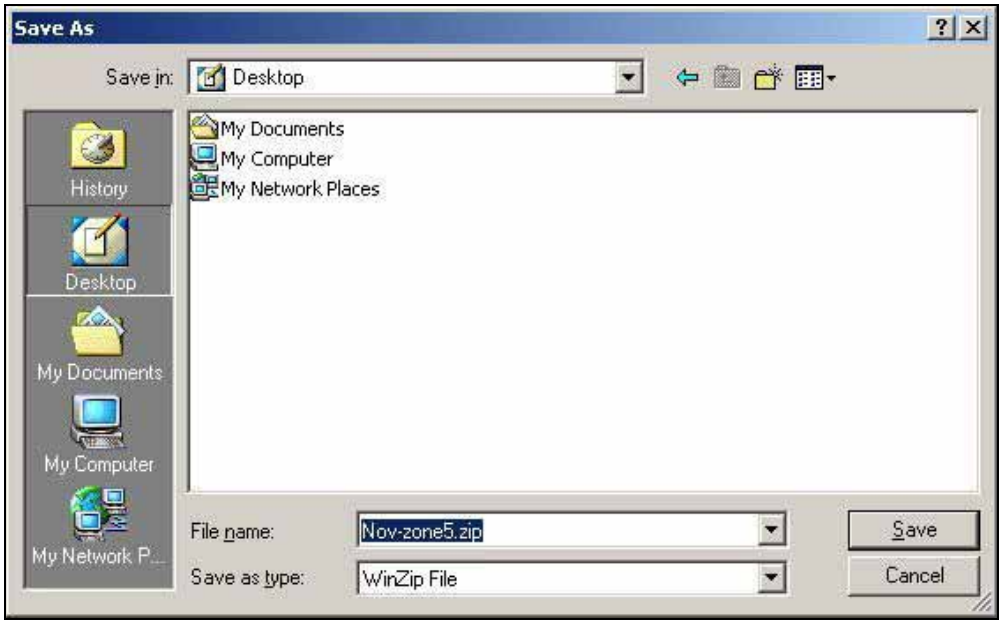


Image 2.3 The Save As box.

3. RUNNING THE MODEL

3.1 Extracting the Microsoft Excel file from the zip file

Important Note – WinZip. You must have WinZip (or equivalent) installed on your computer.

STEP 1 – Find the zip file you have saved on your computer.

STEP 2 – Double click on the file and it will open in WinZip (or equivalent) (see **Image 3.1.1**).

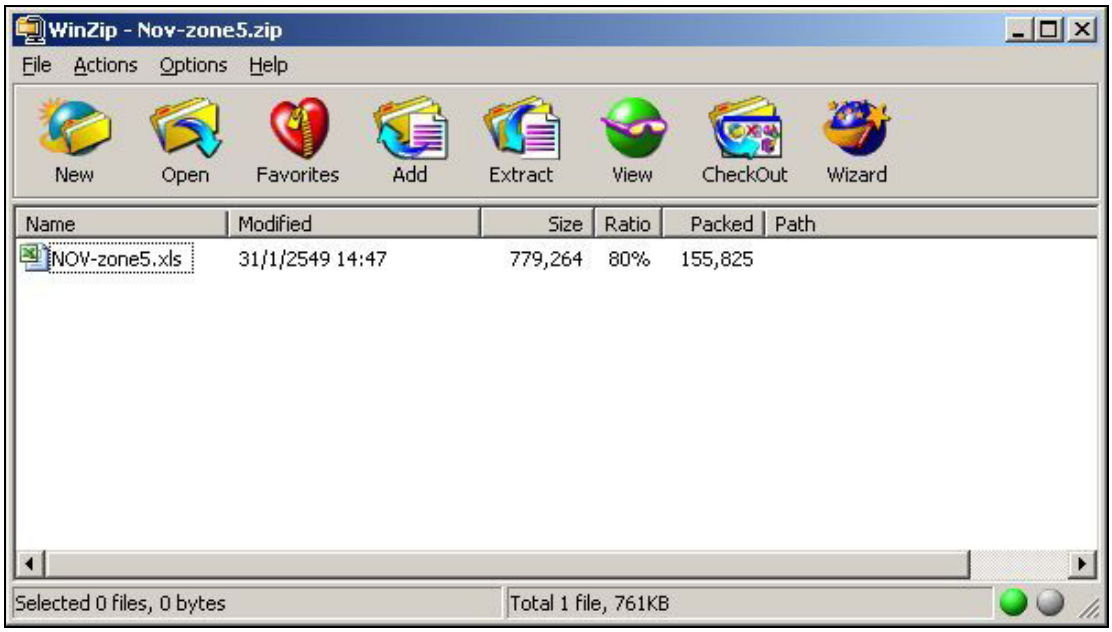

WinZip - Nov-zone5.zip
File Actions Options Help
New Open Favorites Add Extract View CheckOut Wizard
Name Modified Size Ratio Packed Path
NOV-zone5.xls 31/1/2549 14:47 779,264 80% 155,825
Selected 0 files, 0 bytes
Total 1 file, 761KB

Image 3.1.1 The WinZip main page.

STEP 3 – Select your file on the WinZip main page and click the **Extract** button.

STEP 4 – Select the location on your computer you wish to extract the Microsoft Excel file to and click extract (see **Image 3.1.2**).

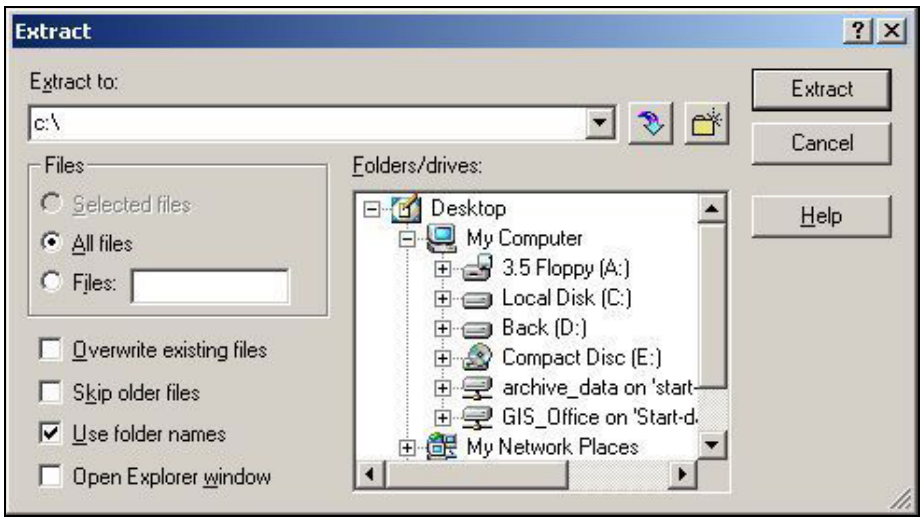


Image 3.1.2 The Extract page of WinZip.

3.2 Opening the Microsoft Excel file

STEP 1 – Find and open the Microsoft Excel file that you have saved on your computer.

Important Note – OPENING THE FILE. Upon opening the file you will receive the security warning shown in **Image 3.2.1**.

Security Warning
"C:\Documents and Settings\pasiree\Desktop\NOV-zone5.xls" contains macros.
Macros may contain viruses. It is usually safe to disable macros, but if the macros are legitimate, you might lose some functionality.
Disable Macros
Enable Macros
More Info

Image 3.2.1 The Security Warning box that will appear on your screen.

STEP 2 – Click **Enable Macros** on the Security Warning box (see **Image 3.2.1**).

Important Note – THE MICROSOFT EXCEL FILE. The Microsoft Excel file is comprised of 11 worksheets. The main sheet is Run-Model. You will become familiar with each sheet as you work through the steps outlined in this manual.

3.3 Enabling Macro Reference

STEP 1 – Select the Run-Model worksheet of the Microsoft Excel file (see **Image 3.3.1)**.

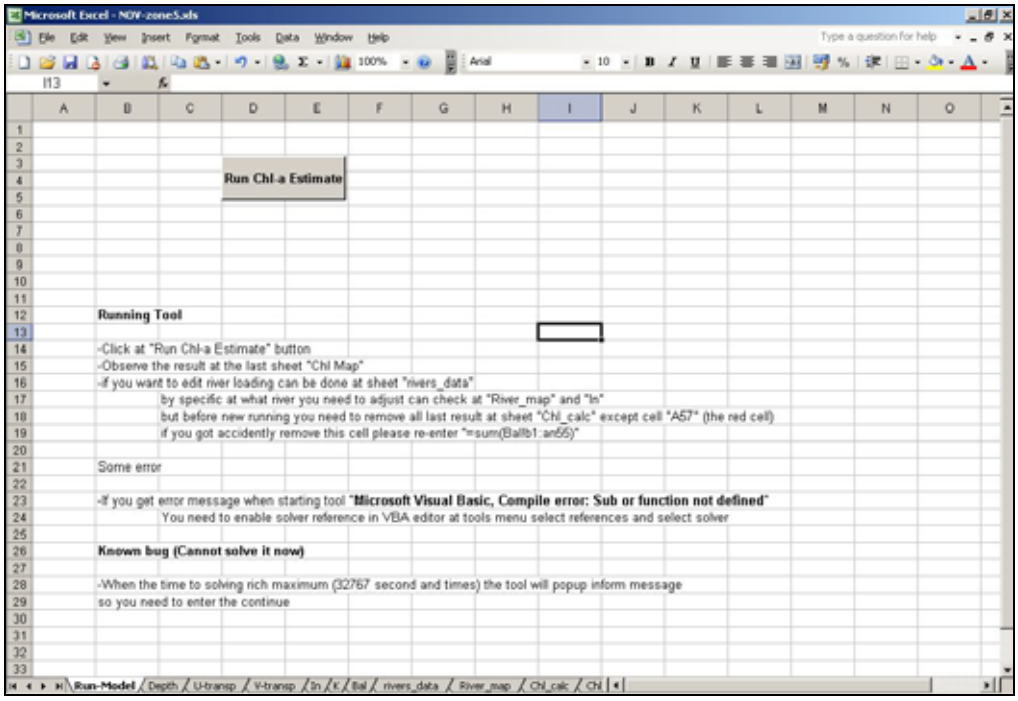

Microsoft Excel - NOV-zone5.xls
Run Chl-a Estimate
Running Tool
-Click at "Run Chl-a Estimate" button
-Observe the result at the last sheet "Chl Map"
-if you want to edit river loading can be done at sheet "rivers_data"
by specific at what river you need to adjust can check at "River_map" and "In"
but before new running you need to remove all last result at sheet "Chl_calc" except cell "A57" (the red cell)
if you got accidently remove this cell please re-enter "=sum(Ball!b1:an65)"
Some error
-If you get error message when starting tool "Microsoft Visual Basic, Compile error: Sub or function not defined"
You need to enable solver reference in VBA editor at tools menu select references and select solver
Known bug (Cannot solve it now)
-When the time to solving rich maximum (32767 second and times) the tool will popup inform message
so you need to enter the continue

Image 3.3.1 The Run-Model sheet of the Microsoft Excel file.

STEP 2 – Select the Visual Basic Editor from the Macros option of the Tools menu (see **Image 3.3.2)**.

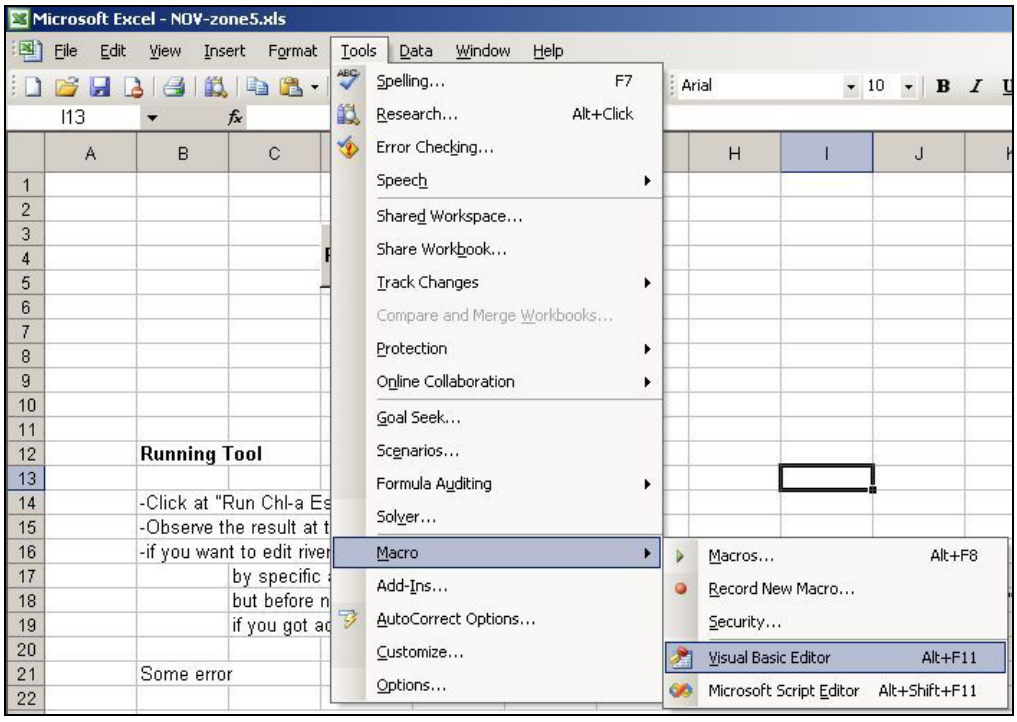


Image 3.3.2 The Visual Basic Editor on the Macros option of the Tools Menu.

STEP 3 – Select References from the Tools menu (see **Image 3.3.3)**.

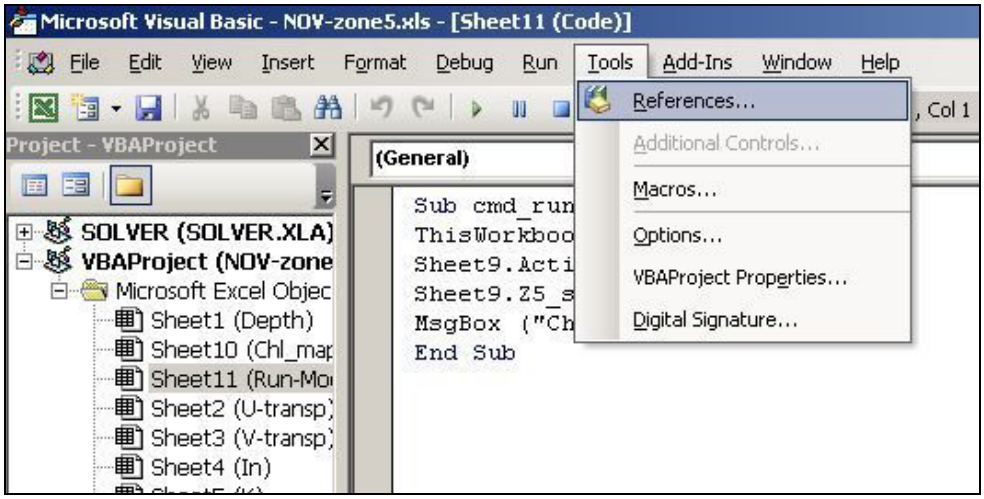


Image 3.3.3 The References option on the Tools Menu.

STEP 4 – Select the SOLVER reference from the References box and click OK (see **Image 3.3.4)**.

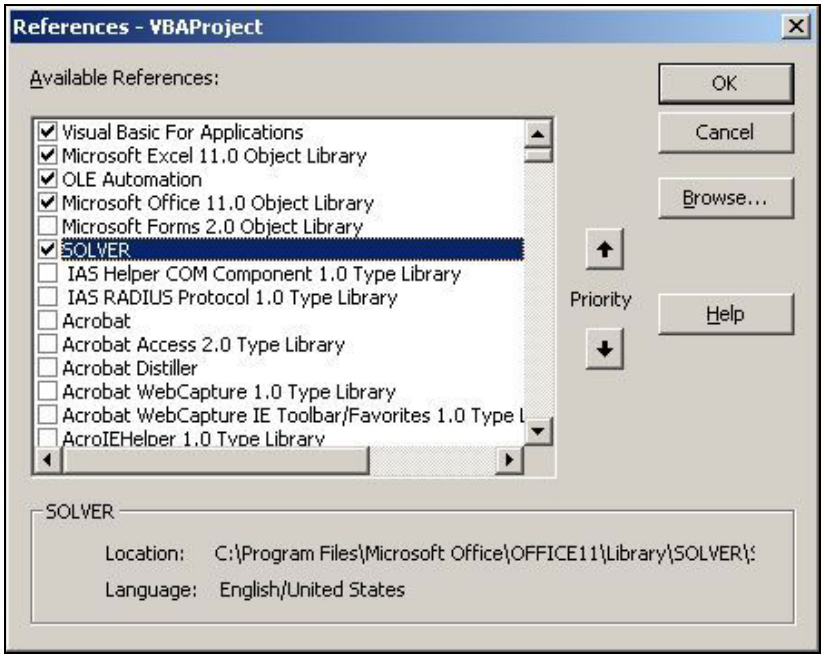


Image 3.3.4 The SOLVER reference selected in the References box.

Important Note – MISSING SOLVER REFERENCE. If you can see MISSING: SOLVER in the list of available references in the References box, you need to browse for the SOLVER REFERENCE on your computer. The steps are:

1. Click **Browse** in the References box
2. Find the solver reference
   - **Microsoft 2002 = C:/Program Files/Microsoft Office/OFFICE10/Library/SOLVER/SOLVER.xla**
   - **Microsoft 2003 = C:/Program Files/Microsoft Office/OFFICE11/Library/SOLVER/SOLVER.xla**
3. Click **Open** on the Add Reference box
4. Check the SOLVER box in the References box and click **OK** (see **Image 3.3.4**).

STEP 5 – Close Microsoft Excel.

STEP 6 – Re-open the Microsoft Excel file.

3.4 Running the Model

STEP 1 – Select the Run-Model worksheet of the Microsoft Excel file.

STEP 2 – Click on the Run Chl-a Estimate box on the Run-Model worksheet (see **Image 3.4.1**).

Image 3.4.1 The Run Chl-a Estimate box on the Run-Model worksheet.

STEP 3 – Click on the Run Chl-a Estimate box on the Run-Model worksheet (see **Image 3.4.1**).

Important Note. Upon clicking on the Run Chl-a Estimate box, you will automatically be transferred to the **Chl_calc** worksheet. You can observe the model running by looking at the trial solution in the bottom left hand corner of the **Chl_calc** worksheet. Running the model for an individual sub-zone may take 1-2 hours depending on the sub-zone selected and the capability of your computer's processor. When the model finishes running you will get a message asking you if you want to replace the file (see **Image 3.4.2**).

Image 3.4.2 The replace file message.

STEP 5 – Click **Yes** on the replace file message (see **Image 3.4.2**). You will then receive a message **Chl-a Estimate finish...** (see **Image 3.4.3)**. Click **OK**.

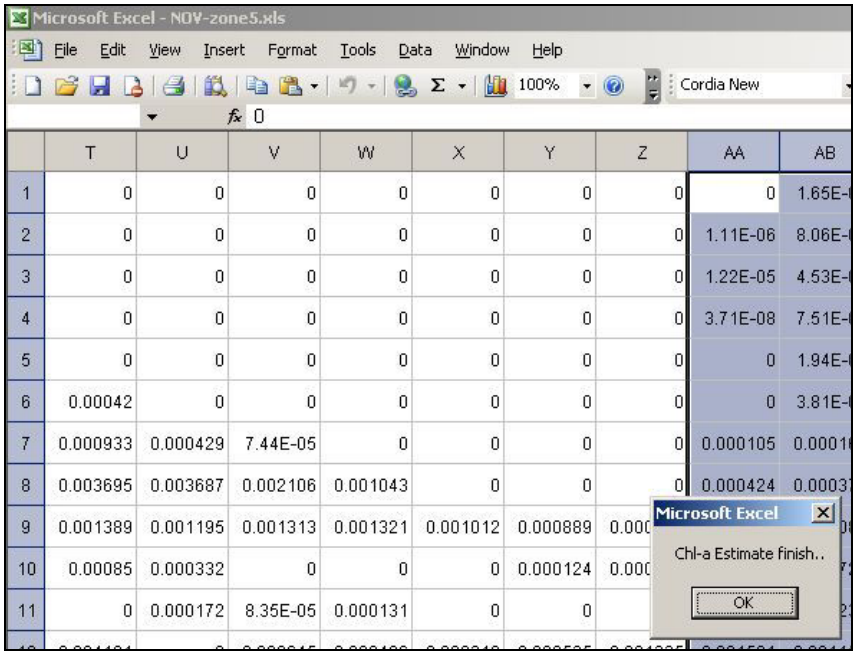


Image 3.4.3 The Chl-a Estimate finish… message box.

3.5 Interpreting the Model Outputs

It is possible to observe the model outputs in the **Chl_map** worksheet (for example see **Image 3.5.1**).

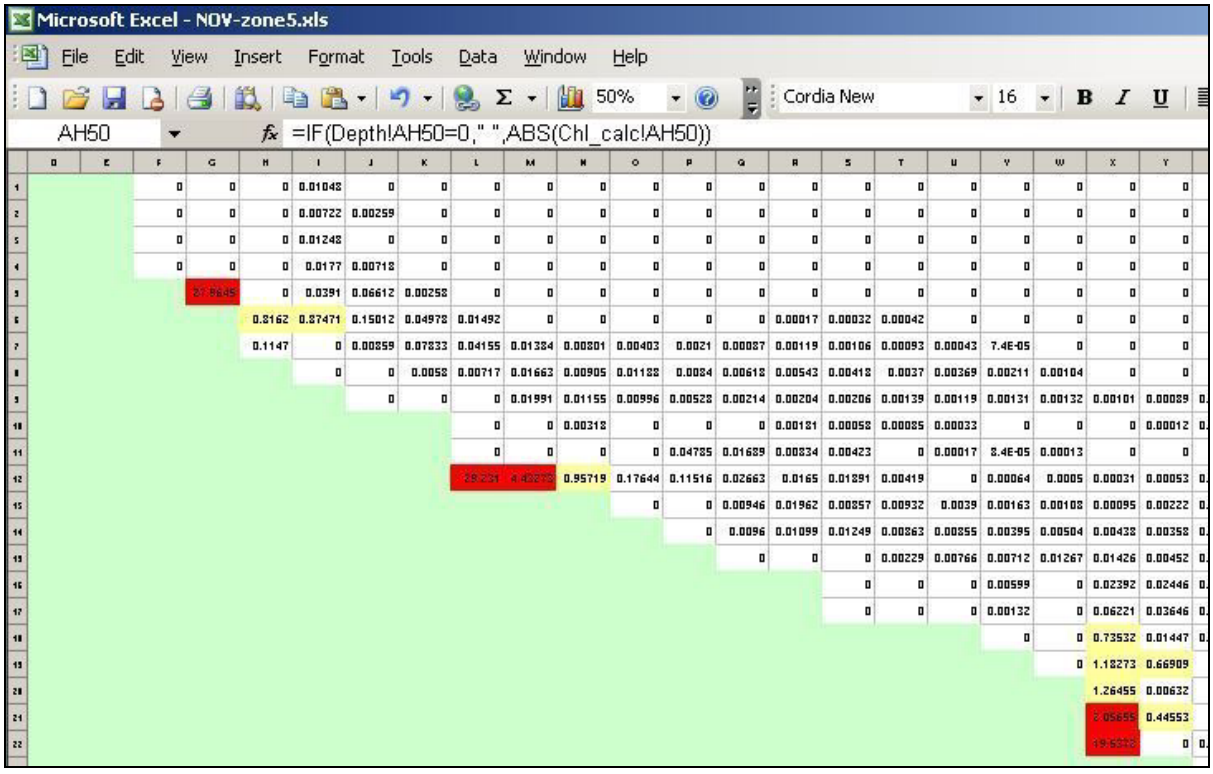


Image 3.5.1 An example of the **Chl_map** worksheet after running the model and saving the file.

The numbers in the cells are the predicted Chl-a concentrations in mg/m^3, based on the nutrient loading and oceanographic parameters used in the model for the given sub-zone. A key to the colour scale used in the **Chl_map** worksheet is shown in Table 1.

Table 1 Key to the colour scale used in the Chl_map worksheet.

State	Chlorophyll Concentration (mg/m^3)	Colour Scale
Eutrophic	>2	Red
Highly productive	0.2 - 2	Yellow
Oligotrophic	<0.2	No Color
Land	-	Green

3.6 Identifying the Geographical Location of a Sub-Zone

The **Chl_map** worksheet for each sub-zone does not include latitudes and longitudes for given locations on the selected sub-zone. A general indication of the geographical location of the sub-zone can be found by looking at where the sub-zone is located within the South China Sea on the Nutrient Carrying Capacity Model homepage. The latitudes and longitudes for the upper and lower coastal boundaries of each sub-zone are provided on the **Run_Model** worksheet for each sub-zone.

3.7 Identifying the Location and Names of Rivers in a Sub-Zone

3.7.1 Identifying the location of rivers in a sub-zone

The locations of the river mouths in each sub-zone that have been incorporated in the model can be seen by looking at the **River_map** worksheet (see **Image 3.7.1**). The red cells are the river mouths and the numbers in the cells represent the nutrient loading (Chlorophyll equivalent) of the river used in the model in mg-Chl/s.

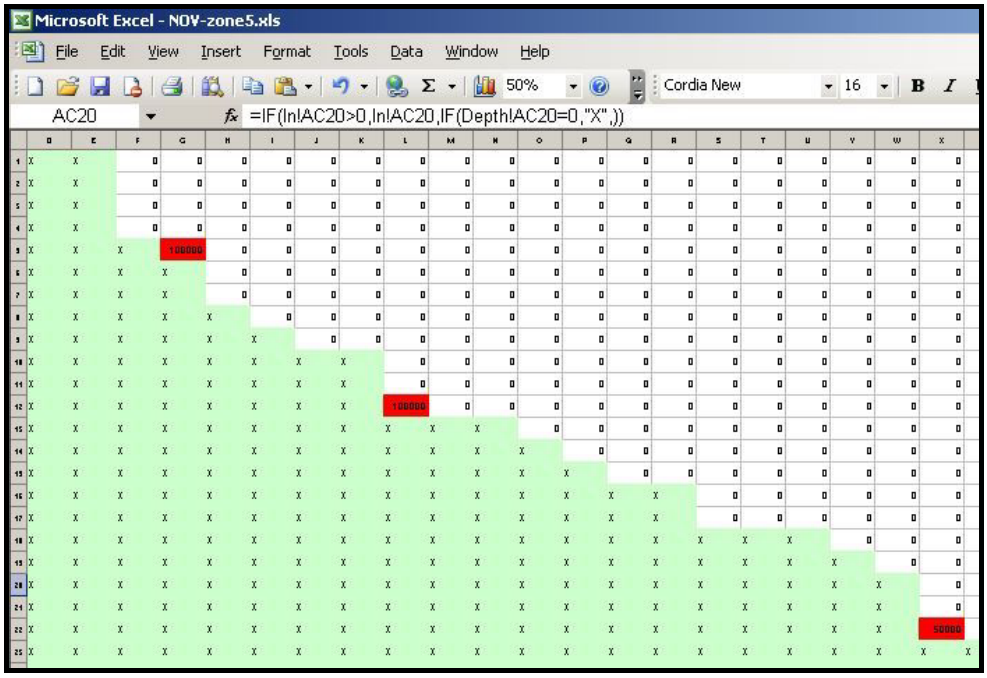


Image 3.7.1 A section of the **River_map** worksheet for a given sub-zone.

3.7.2 Finding the name of a river in a sub-zone

STEP 1 – Record the cell reference (e.g. G5) for a given river on the **River_map** worksheet (see **Image 3.7.2.1)**.

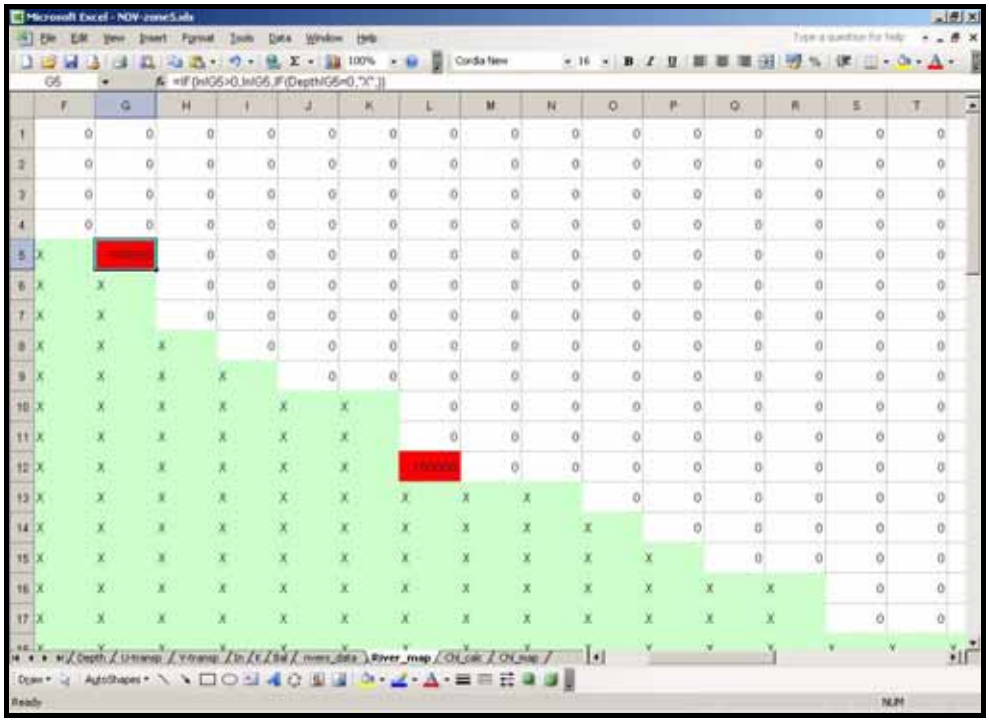


Image 3.7.2.1 A river mouth selected on the **River_map** worksheet.

STEP 2 – Select the **In** worksheet.

STEP 3 – Click on the cell you recorded the reference for at STEP 1 (see **Image 3.7.2.2**).

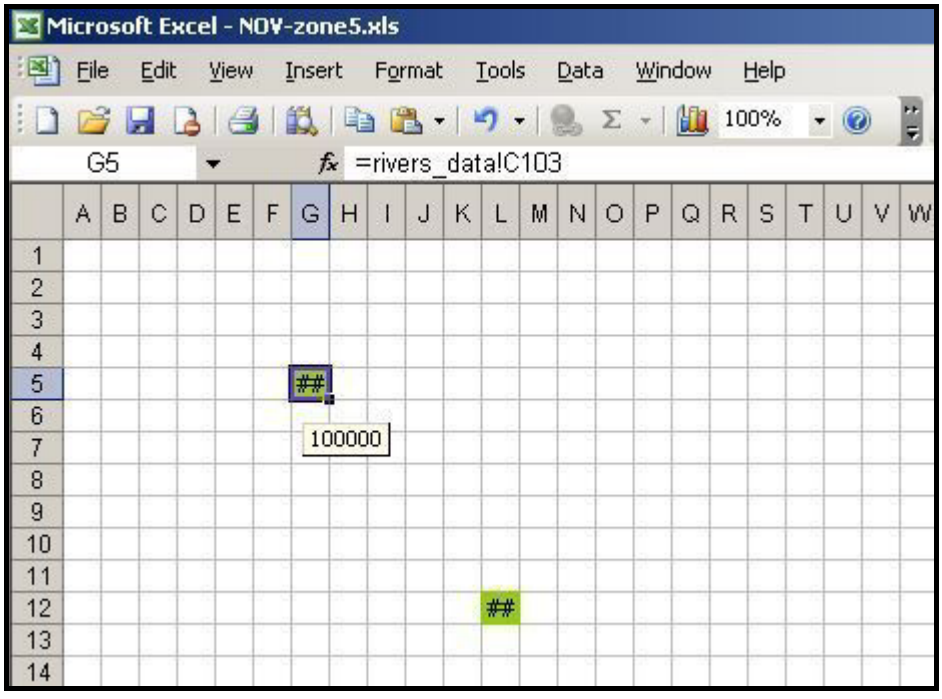
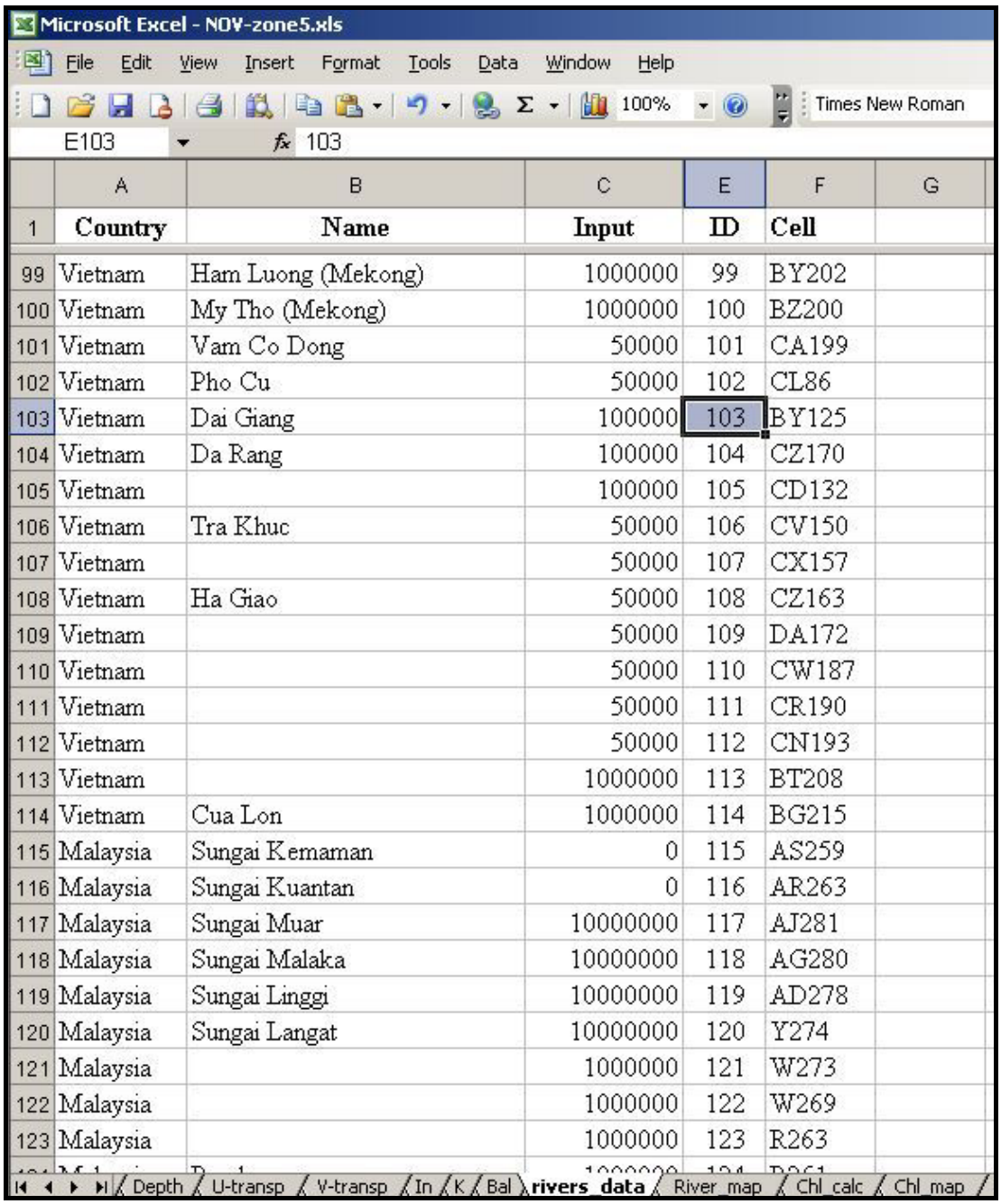


Image 3.7.2.2 An section of the **In** worksheet for a sub-zone.

STEP 4 – Record the RIVER ID NUMBER provided in ***fx*** area of the worksheet.

Important Note – RIVER ID NUMBER 1. In **Image 3.7.2.2** you can see **=rivers_data!C103** in the ***fx*** area of the worksheet. In this case, the RIVER ID NUMBER is **103.** The RIVER ID NUMBER for other rivers is the number that is provided after the **=rivers_data!**.

STEP 5 – Select the **rivers_data** sheet (see **Image 3.7.2.3**).


Microsoft Excel - NOV-zone5.xls
File Edit View Insert Format Tools Data Window Help
100%
Times New Roman
E103
fx 103
Depth U-transp V-transp In K Bal rivers_data River_map Chl_calc Chl_map

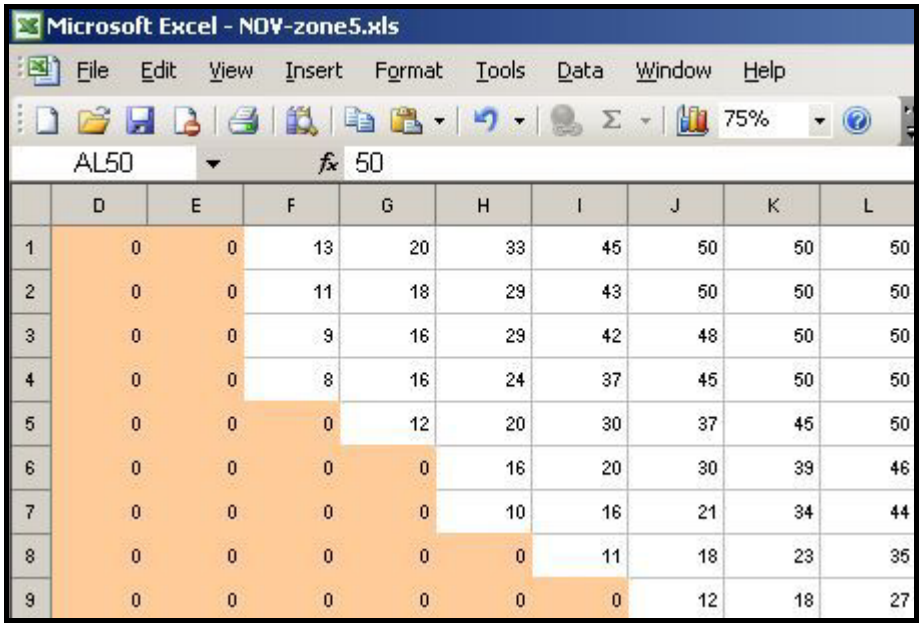
	A	B	C	E	F	G
1	**Country**	**Name**	**Input**	**ID**	**Cell**	
99	Vietnam	Ham Luong (Mekong)	1000000	99	BY202	
100	Vietnam	My Tho (Mekong)	1000000	100	BZ200	
101	Vietnam	Vam Co Dong	50000	101	CA199	
102	Vietnam	Pho Cu	50000	102	CL86	
103	Vietnam	Dai Giang	100000	103	BY125	
104	Vietnam	Da Rang	100000	104	CZ170	
105	Vietnam		100000	105	CD132	
106	Vietnam	Tra Khuc	50000	106	CV150	
107	Vietnam		50000	107	CX157	
108	Vietnam	Ha Giao	50000	108	CZ163	
109	Vietnam		50000	109	DA172	
110	Vietnam		50000	110	CW187	
111	Vietnam		50000	111	CR190	
112	Vietnam		50000	112	CN193	
113	Vietnam		1000000	113	BT208	
114	Vietnam	Cua Lon	1000000	114	BG215	
115	Malaysia	Sungai Kemaman	0	115	AS259	
116	Malaysia	Sungai Kuantan	0	116	AR263	
117	Malaysia	Sungai Muar	10000000	117	AJ281	
118	Malaysia	Sungai Malaka	10000000	118	AG280	
119	Malaysia	Sungai Linggi	10000000	119	AD278	
120	Malaysia	Sungai Langat	10000000	120	Y274	
121	Malaysia		1000000	121	W273	
122	Malaysia		1000000	122	W269	
123	Malaysia		1000000	123	R263	

Image 3.7.2.3 An example of the **rivers_data** sheet for a given sub-zone.

Important Note – RIVER ID NUMBER 2. You can use the RIVER ID NUMBER on the **rivers_data** page to identify the name of a given river, the country that a river is a located in, the nutrient loading (**Input**) used for the river in the model. The **Input** data or nutrient loading (Chlorophyll equivalent) data is provided in mg-Chl/s.

3.8 Identifying depth data used in the model

To identify the bottom depth of coastal waters used for each cell of a sub-zone, select the **Depth** worksheet (see **Image 3.8.1**). The maximum depth used in the model is 50 metres. Waters deeper than 50 metres were considered to be 50 metres deep.



	D	E	F	G	H	I	J	K	L
1	0	0	13	20	33	45	50	50	50
2	0	0	11	18	29	43	50	50	50
3	0	0	9	16	29	42	48	50	50
4	0	0	8	16	24	37	45	50	50
5	0	0	0	12	20	30	37	45	50
6	0	0	0	0	16	20	30	39	46
7	0	0	0	0	10	16	21	34	44
8	0	0	0	0	0	11	18	23	35
9	0	0	0	0	0	0	12	18	27

Image 3.8.1 A section of the **Depth** worksheet for a given sub-zone.

Important Note – U-transp, V-transp, K, and Bal worksheets. These worksheets contain the circulation data and vertical nutrient removal data used in the model, and the actual mathematical model. For further information on these aspects of the model, please contact SEA START RC by e-mail anond@start.or.th.

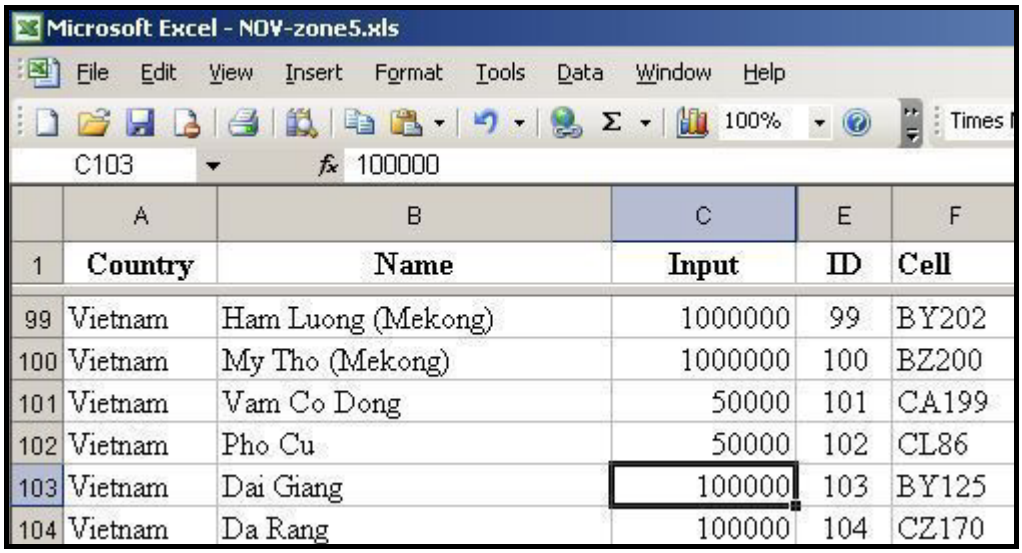
4. CHANGING THE RIVER NUTRIENT LOADING DATA

You can change the nutrient loading data for any river by following these steps:

STEP 1 – Delete all results in the **Chl_calc** worksheet from previous runs of the model, except the cell highlighted in **red**.

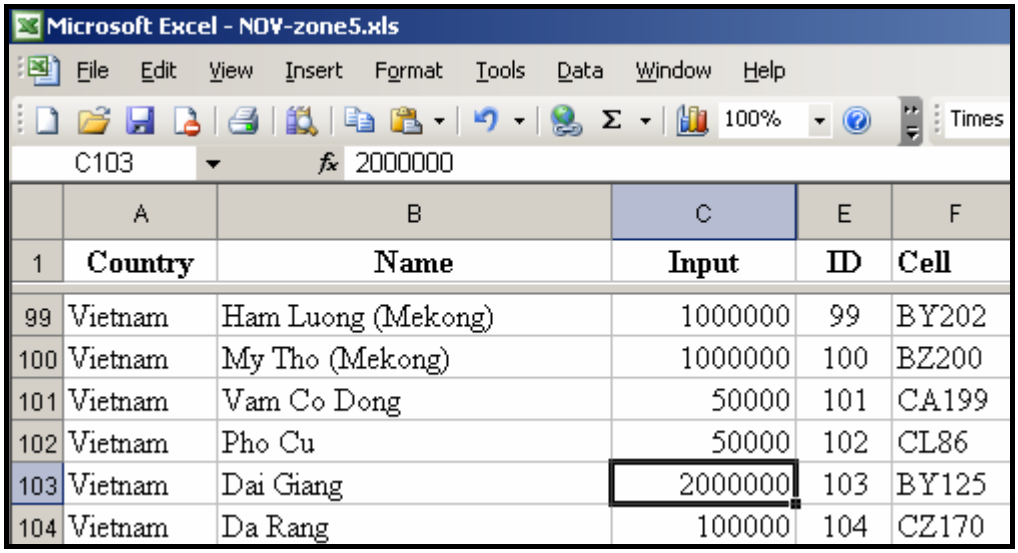
STEP 2 – Select the **rivers_data** sheet for the sub-zone and find the river(s) that you wish to change the I**nput** data for.

STEP 3 – Change the **Input** data as required (see **Images 4.1** and **4.2**).



	A	B	C	E	F
1	**Country**	**Name**	**Input**	**ID**	**Cell**
99	Vietnam	Ham Luong (Mekong)	1000000	99	BY202
100	Vietnam	My Tho (Mekong)	1000000	100	BZ200
101	Vietnam	Vam Co Dong	50000	101	CA199
102	Vietnam	Pho Cu	50000	102	CL86
103	Vietnam	Dai Giang	100000	103	BY125
104	Vietnam	Da Rang	100000	104	CZ170

Image 4.1 A section of the **rivers_data** sheet for a given sub-zone with the **Input** cell selected.



	A	B	C	E	F
1	**Country**	**Name**	**Input**	**ID**	**Cell**
99	Vietnam	Ham Luong (Mekong)	1000000	99	BY202
100	Vietnam	My Tho (Mekong)	1000000	100	BZ200
101	Vietnam	Vam Co Dong	50000	101	CA199
102	Vietnam	Pho Cu	50000	102	CL86
103	Vietnam	Dai Giang	2000000	103	BY125
104	Vietnam	Da Rang	100000	104	CZ170

Image 4.2 The **rivers_data** sheet shown in **Image 4.1** with the **Input** data changed for a river.

STEP 4 – Select the **Run_Model** worksheet.

STEP 5 – Click the **Run Chl-a Estimate** on the **Run_Model** worksheet.

STEP 6 – You will be prompted to save and finish the chl-a estimate, save and click OK. You can interpret the results as shown from Sections 3.4–3.8.

5. ADDING NEW RIVERS OR OTHER SOURCES

Not all rivers in a sub-zone have been used in the model. Users can add or remove rivers in their jurisdictions. It is also possible to add inputs from sources other than rivers, such as effluent from shrimp and fish farms.

STEP 1 – Select the **River_map** worksheet.

STEP 2 – Select an approximate location on the sheet for the source (river or other).

STEP 3 – Record the cell location for the new source (e.g. S17 in **Image 5.1**)

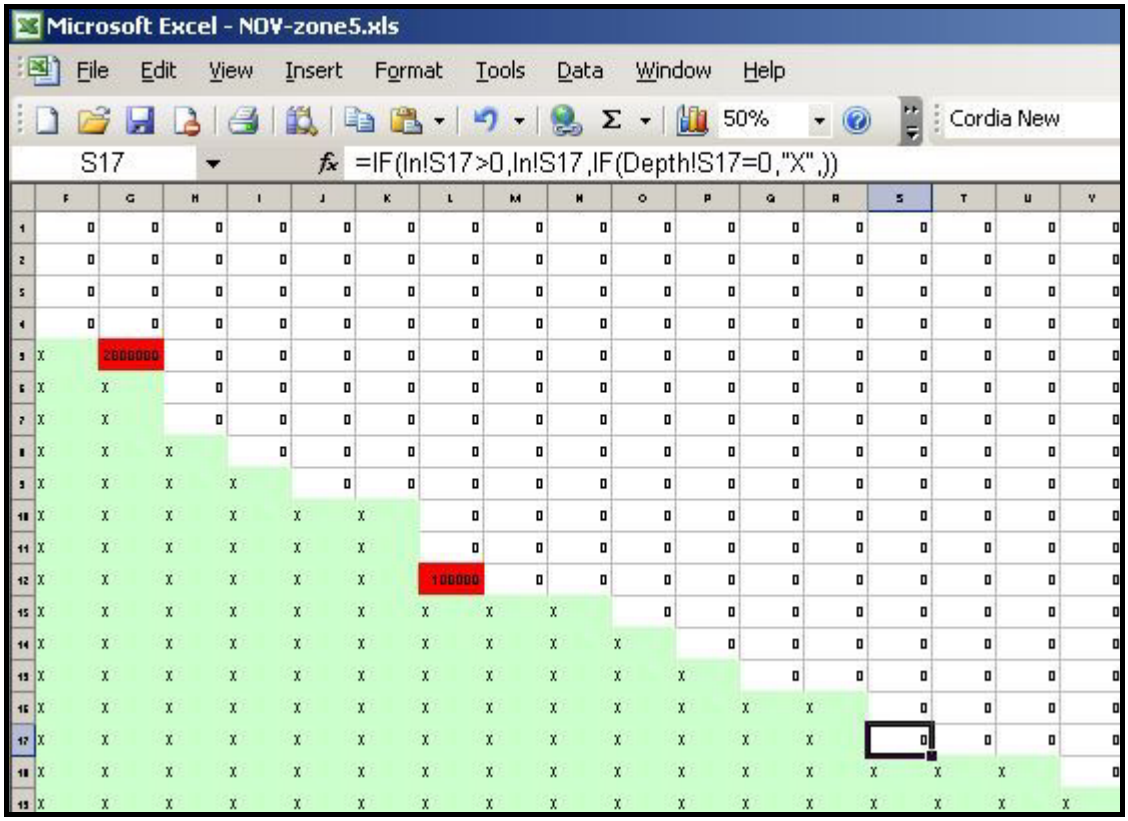
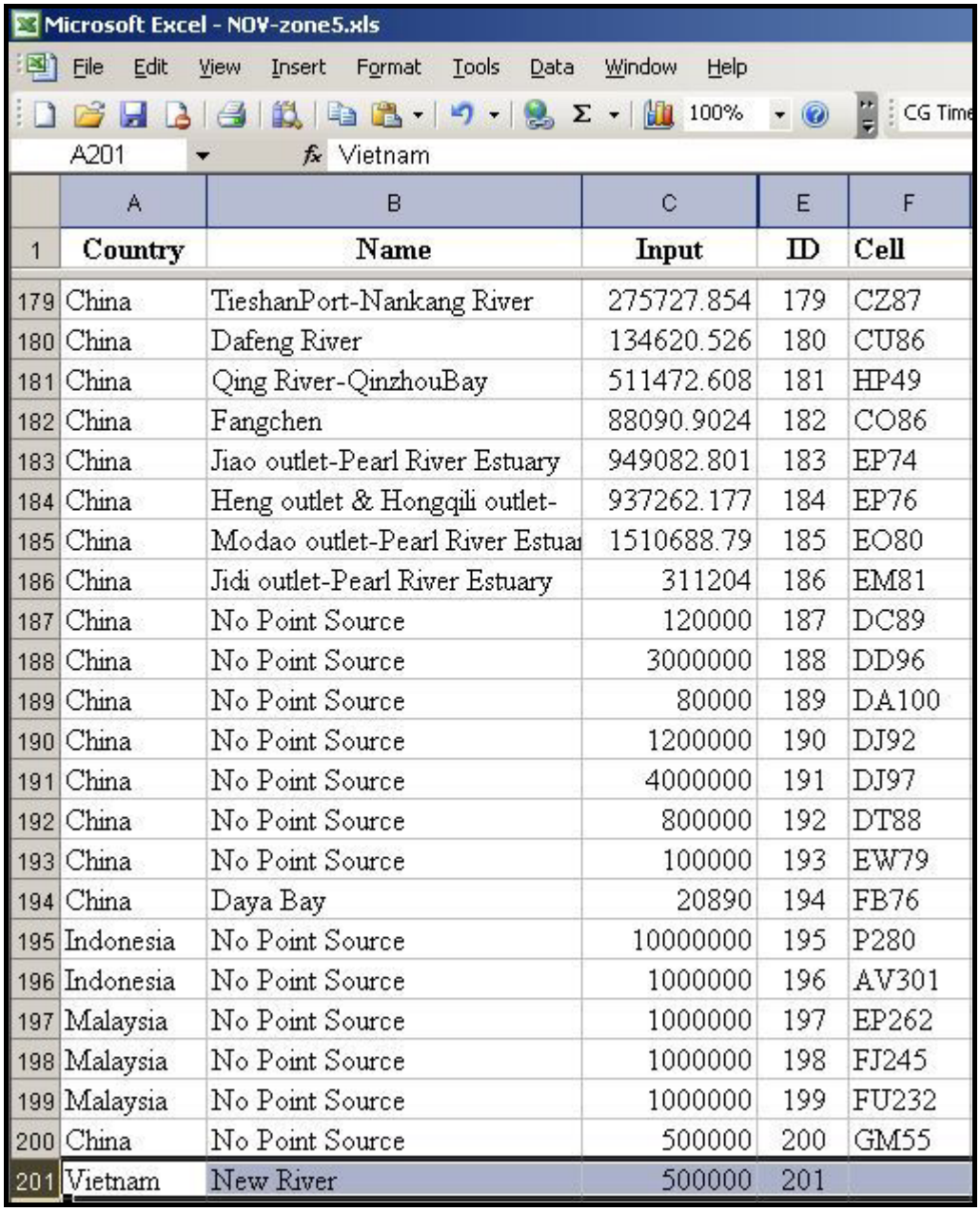


Image 5.1 A location on the **River_map** worksheet selected for a new source.

STEP 4 – Select the **rivers_data** worksheet.

STEP 5 – Add a new record to the **rivers_data** worksheet (see **Image 5.2**). **Do not add an Cell ID.**



	A	B	C	E	F
1	**Country**	**Name**	**Input**	**ID**	**Cell**
179	China	TieshanPort-Nankang River	275727.854	179	CZ87
180	China	Dafeng River	134620.526	180	CU86
181	China	Qing River-QinzhouBay	511472.608	181	HP49
182	China	Fangchen	88090.9024	182	CO86
183	China	Jiao outlet-Pearl River Estuary	949082.801	183	EP74
184	China	Heng outlet & Hongqili outlet-	937262.177	184	EP76
185	China	Modao outlet-Pearl River Estuar	1510688.79	185	EO80
186	China	Jidi outlet-Pearl River Estuary	311204	186	EM81
187	China	No Point Source	120000	187	DC89
188	China	No Point Source	3000000	188	DD96
189	China	No Point Source	80000	189	DA100
190	China	No Point Source	1200000	190	DJ92
191	China	No Point Source	4000000	191	DJ97
192	China	No Point Source	800000	192	DT88
193	China	No Point Source	100000	193	EW79
194	China	Daya Bay	20890	194	FB76
195	Indonesia	No Point Source	10000000	195	P280
196	Indonesia	No Point Source	1000000	196	AV301
197	Malaysia	No Point Source	1000000	197	EP262
198	Malaysia	No Point Source	1000000	198	FJ245
199	Malaysia	No Point Source	1000000	199	FU232
200	China	No Point Source	500000	200	GM55
201	Vietnam	New River	500000	201	

Image 5.2 An example of a new river added to the **rivers_data** worksheet.

STEP 6 – Select the **In** worksheet and click on the cell selected at **STEP 1** and recorded at **STEP 2**.

STEP 7 – Type **=** in the selected cell.

STEP 8 – Select the **rivers_data** worksheet.

STEP 9 – Select the **Input** cell for the new river worksheet and press **ENTER**.

Important Note. If you have followed the **STEPS 1-9** correctly, the new source will be displayed on the **River_map** worksheet. If you wish to re-run the model with the new river, delete all results in the **Chl_calc** worksheet from previous runs of the model, except the cell highlighted in **red**, and follow the run model instructions provided in **Section 3**.

Important Note – Removing Rivers. If you wish to remove the effects of a river or source on the model outputs, simply set the river or source as inactive by setting the input for the river to 0 in the **rivers_data** worksheet.

Important Note – Running the Model for the Entire South China Sea. The instructions provided in this manual have been provided in relation to the use of the model at the sub-zone level. It is possible, however, to download data for the whole of the South China Sea from the Nutrient Carrying Capacity Model page of the South China Sea Project website <www.unepscs.org>. The steps described in this manual can be directly applied to the modeling of nutrient carrying capacity in the entire South China Sea basin. Please be warned that running the model for the entire South China Sea will take longer than **24 hours** when using a standard personal computer.